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(54) Self-service terminal

(57) A self-service terminal (10) for receiving disposable containers (100) of valuable media items (108) is described. The terminal comprises: a breaching mechanism (124) for providing an opening in the containers (100); and an emptying mechanism (122) for removing valuable media from the opening in the containers. The terminal further comprises a secure area (50) in which containers are received and opened; and an item storage area (52) in which individual media items are stacked for removal. A dispenser (40) for receiving valuable media items stored in a disposable container (100) is also described.

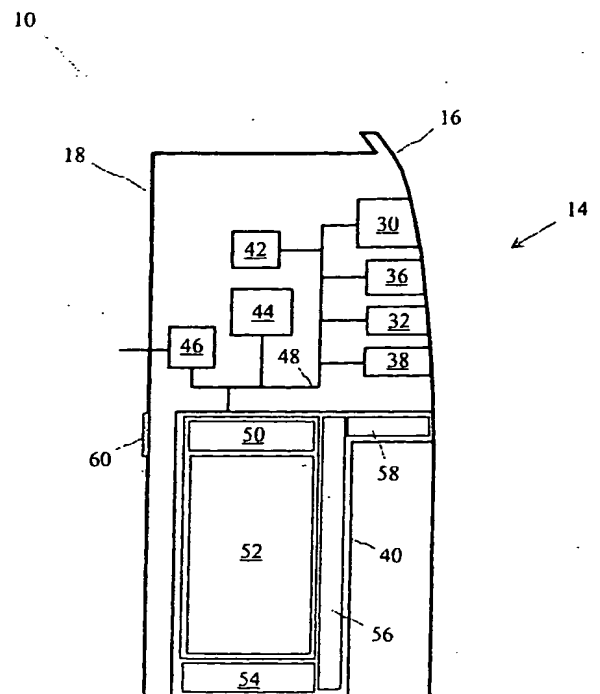


Fig 1

Description

[0001] The invention relates to a self-service terminal (SST) for use with disposable containers. In particular, the invention relates to an automated teller machine (ATM) replenishable with valuable media in sheet form received in disposable containers.

[0002] ATMs are well known as a reliable and convenient source of cash and other financial transactions. To overcome the expense associated with replenishing ATMs using re-usable currency cassettes, it is known to use disposable currency cassettes in an ATM, as described in WO 00/31695.

[0003] According to a first aspect of the present invention there is provided a self-service terminal for receiving disposable containers of valuable media items, the terminal comprising: a breaching mechanism for providing an opening in the containers; and an emptying mechanism for removing valuable media from the opening in the containers; characterised in that the terminal further comprises a secure area in which containers are received and opened; and an item storage area in which individual media items are stacked for removal.

[0004] A conventional pick mechanism may be used to pick media items from the item storage area.

[0005] Preferably, the container comprises a housing coupled to a marker by one or more frangible portions, whereby the breaching mechanism provides an opening in the container by breaking the one or more frangible portions and removing the marker.

[0006] Preferably, the marker has properties similar to the media items stored within the container to facilitate picking of the marker. This has the advantage that the marker can be transferred to the item storage area together with the media items from within the container. In a preferred embodiment, the marker has a property that differs from a corresponding property of the media items (for example, the thickness of the marker is different to the thickness of a media item) so that a pick mechanism can differentiate between a media item and the marker, thereby allowing a picked marker to be diverted to a purge bin.

[0007] Preferably, the SST further comprises a testing mechanism for verifying the integrity of a tamper evident seal.

[0008] Preferably, the contents of the container are only transferred to the item storage area if the tamper evident seal is intact. Any container failing the verification may be retained or returned to the person who loaded the container into the SST.

[0009] Preferably, the container has a machine-readable security identifier. Conveniently, the machine-readable security identifier is a bar-code including information such as the number of notes stored in the container and the denomination of notes stored in the container. Alternatively, the machine-readable identifier may be an electronic tag or such like. The advantage of having an electronic tag is that more information can be stored, for

example, about the media type and quantity stored in the container, an identification of the SST that the media is intended for, the date on which replenishment is due to occur, and such like information.

[0010] By virtue of this aspect of the invention, a disposable container can be loaded into the secure area where the container's integrity is checked, prior to the media items within the container being transferred to the item storage area.

[0011] It will be appreciated that these aspects of the invention have a number of advantages.

1. The dispensing container does not have any urging means for urging media to one surface of the container: the urging means is incorporated in a secure area of the SST into which the container is loaded.

2. The disposable containers greatly increase the range of the number and type of banknotes that can be dispensed.

3. The amount of cash in an ATM can be finely adjusted through the use of disposable containers that hold a small amount of cash.

4. Disposable containers are less expensive to manufacture than re-usable containers.

5. An ATM may be replenishable without putting the ATM out of service.

6. An ATM using such containers generally only requires movement of cash to the ATM, not from the ATM to a currency centre; this obviates the requirements for high security transportation from the ATM to the currency centre.

[0012] According to a second aspect of the present invention there is provided a dispenser for receiving disposable containers of valuable media items, the dispenser comprising: a breaching mechanism for providing an opening in the containers; and an emptying mechanism for removing valuable media from the opening in the containers; characterised in that the dispenser further comprises a secure area in which containers are received and opened; and an item storage area in which individual media items are stacked for removal.

[0013] These and other aspects of the present invention will be apparent from the following specific description, given by way of example, with reference to the accompanying drawings, in which:

Fig 1 is a schematic diagram of an SST including a dispenser for use with disposable containers, according to one embodiment of the invention;

Fig 2a is an exploded diagram illustrating the com-

ponents comprising a container;

Fig 2b is a diagram of the assembled container of Fig 2a;

Figs 3a to 3f are schematic diagrams of the dispenser of Fig 1 at various stages of a loading operation;

Fig 4 is a schematic section view of a part (a secure area) of the terminal of Fig 1;

Fig 5 is a schematic diagram of the secure area of Fig 4, illustrating a disposable container being opened; and

Fig 6 is a schematic diagram of part of the terminal of Fig 1, showing the stage of Fig 3e in more detail.

[0014] Reference is now made to Fig 1, which shows a self-service terminal 10 in the form of an ATM according to one embodiment of the present invention.

[0015] The ATM 10 includes a user interface 14 for outputting information to a user and for allowing a user to input information. The user interface 14 is a moulded fascia 16 pivotably mounted to a chassis 18 and incorporating: a display module 30, an encrypting keypad module 32, and a plurality of slots aligned with modules located behind the fascia 16. The slots include a card entry/exit slot (not shown) that aligns with a magnetic card reader/writer (MCRW) module 36, a printer slot (not shown) that aligns with a printer module 38, and a cash dispense slot (not shown) that aligns with a cash dispense module 40.

[0016] The ATM 10 also includes an internal journal printer module 42 for creating a record of all transactions executed by the ATM 10, an ATM controller module 44 for controlling the operation of the various modules within the ATM, and a network connection module 46 for communicating with a remote transaction host (not shown) for authorising transactions. All of the modules (30 to 46) within the ATM 10 are interconnected by an internal bus 48 for securely conveying data.

[0017] The cash dispenser 40 further comprises a secure area 50 for receiving a disposable container; an item storage area 52 (in the form of a hopper) for storing individual media items removed from a disposable container; a conventional media pick unit 54 for picking media items from the hopper 52; an item transport unit 56 for transporting picked media items; and a media present unit 58 for presenting picked media items to a user of the ATM via the cash dispense slot (not shown).

[0018] The ATM 10 includes a rear access hatch 60 for accessing the cash dispenser 40, as will be described in more detail below.

[0019] Reference is now made to Figs 2a and 2b, which show a portable container 100 made of a strong flexible material having, for example, a paper or plastics base, and comprising a housing 102 and a cover 104.

[0020] The cover 104 defines two apertures 106 and is secured to the housing 102 after media items 108 (in the form of banknotes) have been loaded therein.

[0021] The housing 102 includes a marker (not shown) delineated by a frangible portion (not shown) in the form of a perforated strip. The marker has a similar length, width, and porosity to the banknotes 108 stored within the container 100, but is fifty percent thicker than each banknote 108.

[0022] The container 100 also includes a tamper evident seal 114 that indicates if any part of the container has been tampered with.

[0023] A bar-code label 116 is applied to an upper surface of the container 100 so that the ATM 10 can automatically read the bar-code 116 on loading the container 100 therein. Typically, the bar-code 116 contains information such as the type of notes in the container 100 and the number of notes in the container 100.

[0024] Reference is now made to Figs 3a to 3f, which are schematic section views of the dispenser 40, illustrating stages in replenishing the dispenser 40 by loading and emptying a container 100 therein.

[0025] Access to the secure area 50 is provided by a lockable door 120. When open, the door 120 allows a container 100 to be loaded and unloaded; when closed and locked, the door 120 prevents access to the secure area 50.

[0026] When the dispenser 40 has only a small number of banknotes 128 remaining in the hopper 52, as shown in Fig 3a, then a replenishment operation is required. The hopper banknotes 128 are arranged as a stack, and rest on a platform 130. Platform 130 has an aperture (not shown) for exposing a portion of the lowest banknote in the stack for removal by the pick unit 54.

[0027] To replenish the dispenser 40, an authorised replenisher invokes replenishment mode on the ATM 10. In replenishment mode, the dispenser 40 causes the banknote platform 130 to be raised to the top of the hopper 52. The replenisher unlocks and opens door 60 on the ATM 10, and also door 120 on the secure area 50, as shown in Fig 3b.

[0028] The replenisher then inserts a container 100 into the secure area 50 via the door 120, as shown in Fig 3c, before closing and locking the door 120, as shown in Fig 3d. The container 100 is now held in the secure area 50, where the container 100 is opened, and the banknotes 108 contained therein are transferred to the hopper 52, as shown in Fig 3e.

[0029] Once the banknotes 108 have been removed from the container 100 and transferred into the hopper 52, the replenisher:

- unlocks and opens the secure area door 120;
- removes the empty container 100;
- closes and locks the secure area door 120 and the ATM door 60; and

- returns the ATM 10 to normal operating mode.

[0030] This leaves the secure area 50 empty, as shown in Fig 3f.

[0031] The operation of opening the container 100 and transferring the banknotes 108 stored therein to the hopper 52 will now be described in more detail with reference to Figs 4 to 6.

[0032] Referring first to Fig 4, which shows the secure area 50 of Fig 3d in more detail, the container 100 is entirely enclosed within the secure area 50. The container 100 rests on a retractable base plate 122, and is aligned with a breaching mechanism 124 (in the form of a pusher plate having two tines 126). Each of the tines 126 is in registration with one of the container's apertures 106.

[0033] The secure area 50 also includes a bar-code reader (not shown) that reads the bar-code 116 and conveys the read data to the ATM controller 44 (Fig 1); and a tamper seal detector (not shown) that detects the integrity of the seal 114 and conveys the detected data to the ATM controller 44 (Fig 1).

[0034] The ATM controller 44 determines whether the tamper evident seal 114 is intact. If the seal 114 is not intact then the container is not opened, and the replenisher is requested to remove the container 100 from the secure area 50. If the seal 114 is intact then the bar-code 116 on the container 100 is read to ensure that the container 100 stores banknotes of the correct denomination. If the denomination of banknotes is incorrect (for example, ten pound notes instead of twenty pound notes) then the container 100 is not opened, and the replenisher is requested to remove the container 100 from the secure area 50. If the denomination of banknotes is correct, then the container 100 is opened and emptied, as will now be described with reference to Fig 5.

[0035] To open the container 100, the pusher plate 124 is lowered so that the tines 126 protrude through the apertures 106 (as shown in Fig 5) and force the banknotes 108 within the container 100 against the marker 140, causing the perforated strip 142 to rupture and the marker 140 to detach from the container 100.

[0036] Once the strip 142 has ruptured, the dispenser 40 opens the retractable base plate 122 to allow the detached marker 140 and the banknotes 108 within the container 100 to fall, under the influence of gravity, onto the top of the banknotes 128 within the hopper 52. This is illustrated in Fig 6. When the retractable base plate 122 is open, an interlock (not shown) is set to prevent the secure area door 120 from being unlocked.

[0037] When all of the banknotes 108 have been removed from the container 100 and transferred to the hopper 52, the retractable base plate 122 is closed to isolate the hopper 52 from the secure area 50, and the interlock (not shown) is reset to allow the door 120 to be unlocked. The replenisher then unlocks and opens the doors 60 and 120 and removes the empty container 100

from the secure area 50.

[0038] The replenisher may then load another container 100 into the secure area 50 or return the ATM 10 to normal operating mode. Fig 3f illustrates the dispenser 40 having been loaded with the contents of five containers 100.

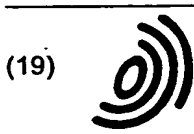
[0039] To dispense banknotes, the pick unit 54 picks individual notes from the hopper 52 in the same way as in a conventional dispenser. When a marker 140 is presented to the pick unit 54, then the marker 140 is picked in the same way as a banknote; however, as the marker has a thickness larger than that of a banknote, a conventional note thickness sensor (not shown) detects that the item picked is not of the correct thickness and diverts the marker to a reject bin (not shown). Thus, markers 140 are not dispensed to users of the ATM 10.

[0040] Using containers 100 in an ATM ensures that the only reverse cash-in-transit is from the reject bin (a standard feature on all ATMs for storing bank notes which have not dispensed properly): there are no partially filled currency cassettes to return to a bullion centre.

[0041] Various modifications may be made to the above described embodiments within the scope of the present invention. For example, in other embodiments, other forms of breaching mechanisms may be used than the one described. In other embodiments, the containers may store share certificates, stamps, tickets, and such like. In other embodiments, the SST may be a non-cash kiosk.

Claims

1. A self-service terminal (10) for receiving disposable containers (100) of valuable media items (108), the terminal comprising: a breaching mechanism (124) for providing an opening in the containers (100); and an emptying mechanism (122) for removing valuable media from the opening in the containers; **characterised in that** the terminal further comprises a secure area (50) in which containers are received and opened; and an item storage area (52) in which individual media items are stacked for removal.
2. A terminal according to claim 1, wherein the container (100) comprises a housing (102) coupled to a marker (140) by one or more frangible portions (142), whereby the breaching mechanism (124) provides an opening in the container (100) by breaking the one or more frangible portions (142) and removing the marker (140).
3. A terminal according to claim 2, wherein the marker (140) has properties similar to the media items (108) stored within the container to facilitate picking of the marker (140).



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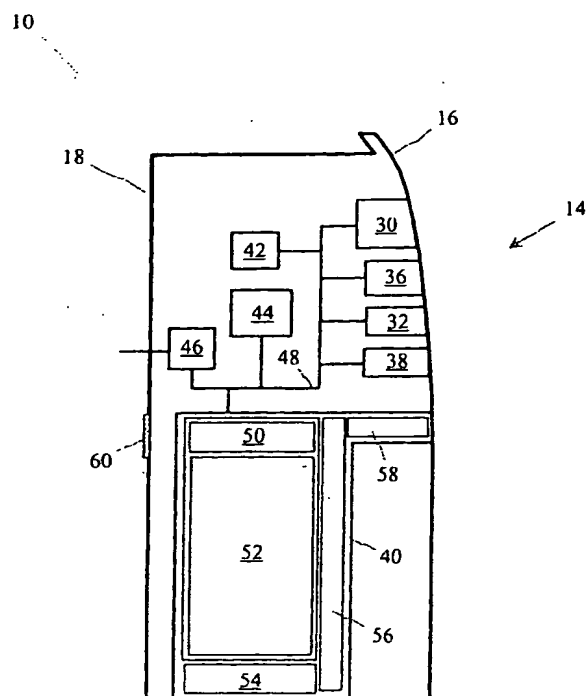


Fig 1

Description

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[0005] Preferably, the container comprises a housing coupled to a marker by one or more frangible portions, whereby the breaching mechanism provides an opening in the container by breaking the one or more frangible portions and removing the marker.

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[0009] Preferably, the container has a machine-readable security identifier. Conveniently, the machine-readable security identifier is a bar-code including information such as the number of notes stored in the container and the denomination of notes stored in the container. Alternatively, the machine-readable identifier may be an electronic tag or such like. The advantage of having an electronic tag is that more information can be stored, for

example, about the media type and quantity stored in the container, an identification of the SST that the media is intended for, the date on which replenishment is due to occur, and such like information.

[0010] By virtue of this aspect of the invention, a disposable container can be loaded into the secure area where the container's integrity is checked, prior to the media items within the container being transferred to the item storage area.

[0011] It will be appreciated that these aspects of the invention have a number of advantages.

1. The dispensing container does not have any urging means for urging media to one surface of the container: the urging means is incorporated in a secure area of the SST into which the container is loaded.

2. The disposable containers greatly increase the range of the number and type of banknotes that can be dispensed.

3. The amount of cash in an ATM can be finely adjusted through the use of disposable containers that hold a small amount of cash.

4. Disposable containers are less expensive to manufacture than re-usable containers.

5. An ATM may be replenishable without putting the ATM out of service.

6. An ATM using such containers generally only requires movement of cash to the ATM, not from the ATM to a currency centre; this obviates the requirements for high security transportation from the ATM to the currency centre.

[0012] According to a second aspect of the present invention there is provided a dispenser for receiving disposable containers of valuable media items, the dispenser comprising: a breaching mechanism for providing an opening in the containers; and an emptying mechanism for removing valuable media from the opening in the containers; characterised in that the dispenser further comprises a secure area in which containers are received and opened; and an item storage area in which individual media items are stacked for removal.

[0013] These and other aspects of the present invention will be apparent from the following specific description, given by way of example, with reference to the accompanying drawings, in which:

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Fig 2a is an exploded diagram illustrating the com-

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Fig 2b is a diagram of the assembled container of Fig 2a;

Figs 3a to 3f are schematic diagrams of the dispenser of Fig 1 at various stages of a loading operation;

Fig 4 is a schematic section view of a part (a secure area) of the terminal of Fig 1;

Fig 5 is a schematic diagram of the secure area of Fig 4, illustrating a disposable container being opened; and

Fig 6 is a schematic diagram of part of the terminal of Fig 1, showing the stage of Fig 3e in more detail.

[0014] Reference is now made to Fig 1, which shows a self-service terminal 10 in the form of an ATM according to one embodiment of the present invention.

[0015] The ATM 10 includes a user interface 14 for outputting information to a user and for allowing a user to input information. The user interface 14 is a moulded fascia 16 pivotably mounted to a chassis 18 and incorporating: a display module 30, an encrypting keypad module 32, and a plurality of slots aligned with modules located behind the fascia 16. The slots include a card entry/exit slot (not shown) that aligns with a magnetic card reader/writer (MCRW) module 36, a printer slot (not shown) that aligns with a printer module 38, and a cash dispense slot (not shown) that aligns with a cash dispense module 40.

[0016] The ATM 10 also includes an internal journal printer module 42 for creating a record of all transactions executed by the ATM 10, an ATM controller module 44 for controlling the operation of the various modules within the ATM, and a network connection module 46 for communicating with a remote transaction host (not shown) for authorising transactions. All of the modules (30 to 46) within the ATM 10 are interconnected by an internal bus 48 for securely conveying data.

[0017] The cash dispenser 40 further comprises a secure area 50 for receiving a disposable container; an item storage area 52 (in the form of a hopper) for storing individual media items removed from a disposable container; a conventional media pick unit 54 for picking media items from the hopper 52; an item transport unit 56 for transporting picked media items; and a media present unit 58 for presenting picked media items to a user of the ATM via the cash dispense slot (not shown).

[0018] The ATM 10 includes a rear access hatch 60 for accessing the cash dispenser 40, as will be described in more detail below.

[0019] Reference is now made to Figs 2a and 2b, which show a portable container 100 made of a strong flexible material having, for example, a paper or plastics base, and comprising a housing 102 and a cover 104.

[0020] The cover 104 defines two apertures 106 and is secured to the housing 102 after media items 108 (in the form of banknotes) have been loaded therein.

[0021] The housing 102 includes a marker (not shown) delineated by a frangible portion (not shown) in the form of a perforated strip. The marker has a similar length, width, and porosity to the banknotes 108 stored within the container 100, but is fifty percent thicker than each banknote 108.

[0022] The container 100 also includes a tamper evident seal 114 that indicates if any part of the container has been tampered with.

[0023] A bar-code label 116 is applied to an upper surface of the container 100 so that the ATM 10 can automatically read the bar-code 116 on loading the container 100 therein. Typically, the bar-code 116 contains information such as the type of notes in the container 100 and the number of notes in the container 100.

[0024] Reference is now made to Figs 3a to 3f, which are schematic section views of the dispenser 40, illustrating stages in replenishing the dispenser 40 by loading and emptying a container 100 therein.

[0025] Access to the secure area 50 is provided by a lockable door 120. When open, the door 120 allows a container 100 to be loaded and unloaded; when closed and locked, the door 120 prevents access to the secure area 50.

[0026] When the dispenser 40 has only a small number of banknotes 128 remaining in the hopper 52, as shown in Fig 3a, then a replenishment operation is required. The hopper banknotes 128 are arranged as a stack, and rest on a platform 130. Platform 130 has an aperture (not shown) for exposing a portion of the lowest banknote in the stack for removal by the pick unit 54.

[0027] To replenish the dispenser 40, an authorised replenisher invokes replenishment mode on the ATM 10. In replenishment mode, the dispenser 40 causes the banknote platform 130 to be raised to the top of the hopper 52. The replenisher unlocks and opens door 60 on the ATM 10, and also door 120 on the secure area 50, as shown in Fig 3b.

[0028] The replenisher then inserts a container 100 into the secure area 50 via the door 120, as shown in Fig 3c, before closing and locking the door 120, as shown in Fig 3d. The container 100 is now held in the secure area 50, where the container 100 is opened, and the banknotes 108 contained therein are transferred to the hopper 52, as shown in Fig 3e.

[0029] Once the banknotes 108 have been removed from the container 100 and transferred into the hopper 52, the replenisher:

- unlocks and opens the secure area door 120;
- removes the empty container 100;
- closes and locks the secure area door 120 and the ATM door 60; and

- returns the ATM 10 to normal operating mode.

[0030] This leaves the secure area 50 empty, as shown in Fig 3f.

[0031] The operation of opening the container 100 and transferring the banknotes 108 stored therein to the hopper 52 will now be described in more detail with reference to Figs 4 to 6.

[0032] Referring first to Fig 4, which shows the secure area 50 of Fig 3d in more detail, the container 100 is entirely enclosed within the secure area 50. The container 100 rests on a retractable base plate 122, and is aligned with a breaching mechanism 124 (in the form of a pusher plate having two tines 126). Each of the tines 126 is in registration with one of the container's apertures 106.

[0033] The secure area 50 also includes a bar-code reader (not shown) that reads the bar-code 116 and conveys the read data to the ATM controller 44 (Fig 1); and a tamper seal detector (not shown) that detects the integrity of the seal 114 and conveys the detected data to the ATM controller 44 (Fig 1).

[0034] The ATM controller 44 determines whether the tamper evident seal 114 is intact. If the seal 114 is not intact then the container is not opened, and the replenisher is requested to remove the container 100 from the secure area 50. If the seal 114 is intact then the bar-code 116 on the container 100 is read to ensure that the container 100 stores banknotes of the correct denomination. If the denomination of banknotes is incorrect (for example, ten pound notes instead of twenty pound notes) then the container 100 is not opened, and the replenisher is requested to remove the container 100 from the secure area 50. If the denomination of banknotes is correct, then the container 100 is opened and emptied, as will now be described with reference to Fig 5.

[0035] To open the container 100, the pusher plate 124 is lowered so that the tines 126 protrude through the apertures 106 (as shown in Fig 5) and force the banknotes 108 within the container 100 against the marker 140, causing the perforated strip 142 to rupture and the marker 140 to detach from the container 100.

[0036] Once the strip 142 has ruptured, the dispenser 40 opens the retractable base plate 122 to allow the detached marker 140 and the banknotes 108 within the container 100 to fall, under the influence of gravity, onto the top of the banknotes 128 within the hopper 52. This is illustrated in Fig 6. When the retractable base plate 122 is open, an interlock (not shown) is set to prevent the secure area door 120 from being unlocked.

[0037] When all of the banknotes 108 have been removed from the container 100 and transferred to the hopper 52, the retractable base plate 122 is closed to isolate the hopper 52 from the secure area 50, and the interlock (not shown) is reset to allow the door 120 to be unlocked. The replenisher then unlocks and opens the doors 60 and 120 and removes the empty container 100

from the secure area 50.

[0038] The replenisher may then load another container 100 into the secure area 50 or return the ATM 10 to normal operating mode. Fig 3f illustrates the dispenser 40 having been loaded with the contents of five containers 100.

[0039] To dispense banknotes, the pick unit 54 picks individual notes from the hopper 52 in the same way as in a conventional dispenser. When a marker 140 is presented to the pick unit 54, then the marker 140 is picked in the same way as a banknote; however, as the marker has a thickness larger than that of a banknote, a conventional note thickness sensor (not shown) detects that the item picked is not of the correct thickness and diverts the marker to a reject bin (not shown). Thus, markers 140 are not dispensed to users of the ATM 10.

[0040] Using containers 100 in an ATM ensures that the only reverse cash-in-transit is from the reject bin (a standard feature on all ATMs for storing bank notes which have not dispensed properly): there are no partially filled currency cassettes to return to a bullion centre.

[0041] Various modifications may be made to the above described embodiments within the scope of the present invention. For example, in other embodiments, other forms of breaching mechanisms may be used than the one described. In other embodiments, the containers may store share certificates, stamps, tickets, and such like. In other embodiments, the SST may be a non-cash kiosk.

Claims

1. A self-service terminal (10) for receiving disposable containers (100) of valuable media items (108), the terminal comprising: a breaching mechanism (124) for providing an opening in the containers (100); and an emptying mechanism (122) for removing valuable media from the opening in the containers; **characterised in that** the terminal further comprises a secure area (50) in which containers are received and opened; and an item storage area (52) in which individual media items are stacked for removal.
2. A terminal according to claim 1, wherein the container (100) comprises a housing (102) coupled to a marker (140) by one or more frangible portions (142), whereby the breaching mechanism (124) provides an opening in the container (100) by breaking the one or more frangible portions (142) and removing the marker (140).
3. A terminal according to claim 2, wherein the marker (140) has properties similar to the media items (108) stored within the container to facilitate picking of the marker (140).

4. A terminal according to claim 3, wherein the marker (140) has a property that differs from a corresponding property of the media items (108) so that a pick mechanism can differentiate between a media item (108) and the marker (140), thereby allowing a picked marker (140) to be diverted to a purge bin. 5
5. A terminal according to any preceding claim, wherein the terminal further comprises a testing mechanism for verifying the integrity of a tamper evident seal (114). 10
6. A dispenser (40) for receiving disposable containers (100) of valuable media items (108), the dispenser comprising: a breaching mechanism (124) 15 for providing an opening in the containers (100); and an emptying mechanism (122) for removing valuable media from the opening in the containers (100); characterised in that the dispenser (40) further comprises a secure area (50) in which containers are received and opened; and an item storage area (52) in which individual media items are stacked for removal. 20

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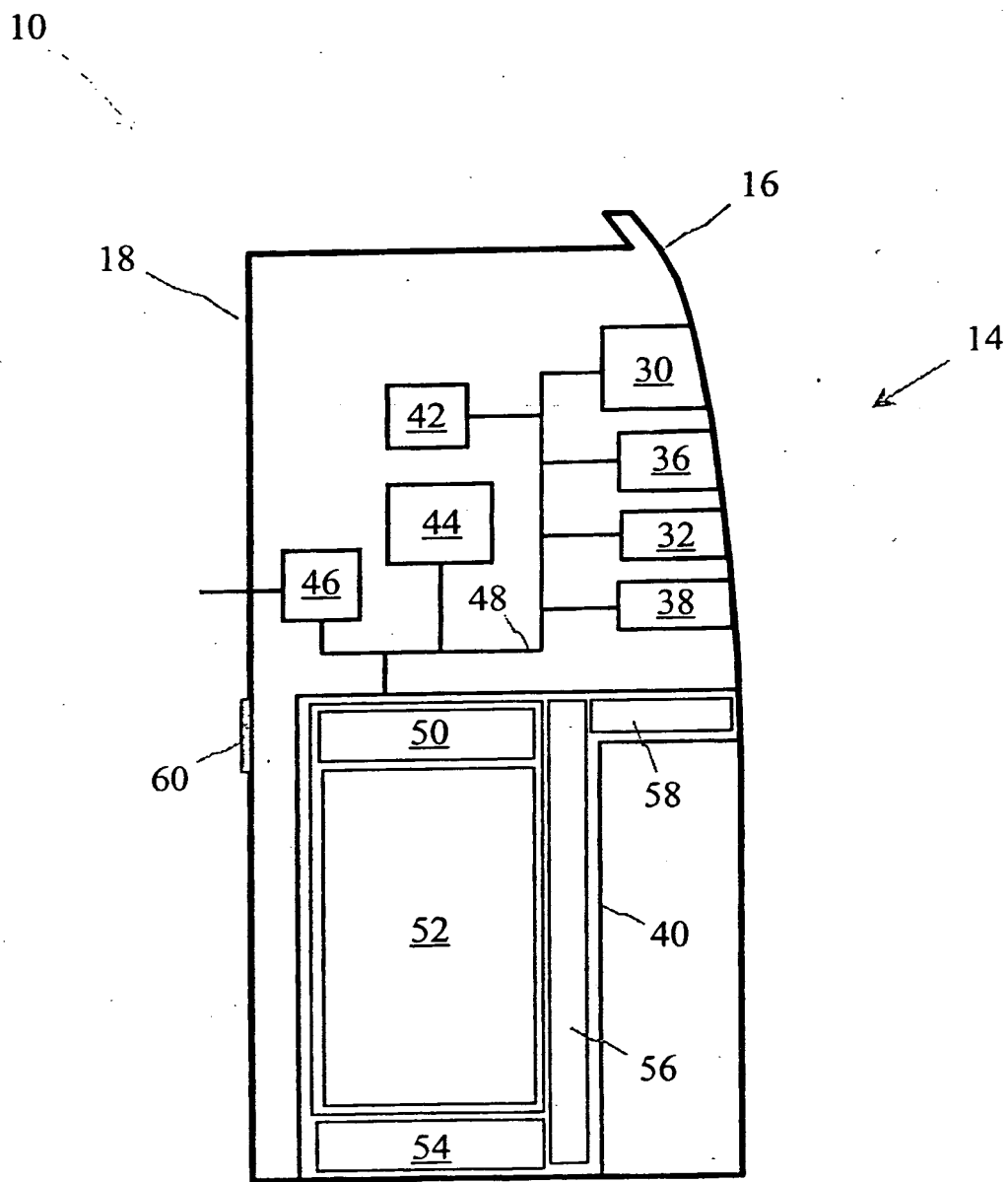


Fig 1

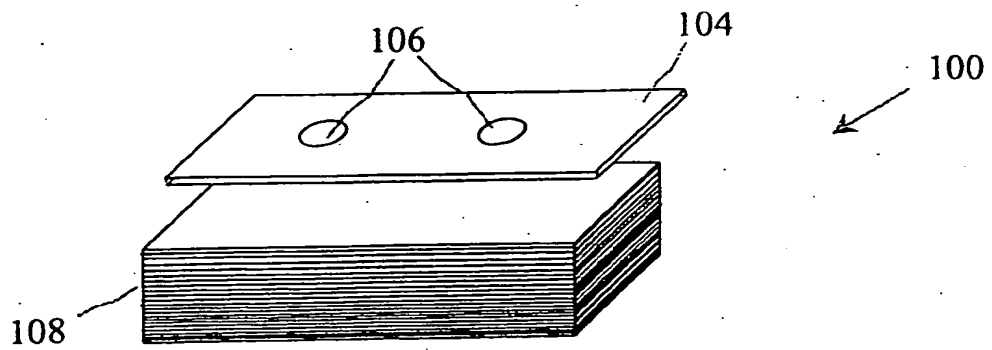


Fig 2a

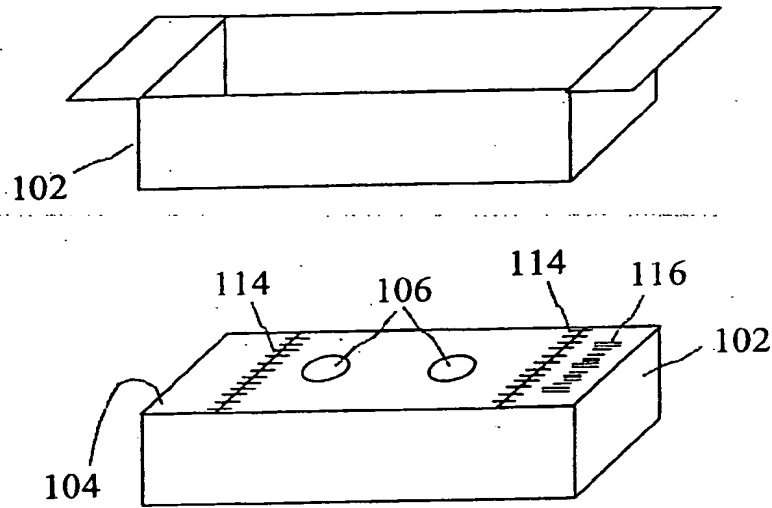


Fig 2b

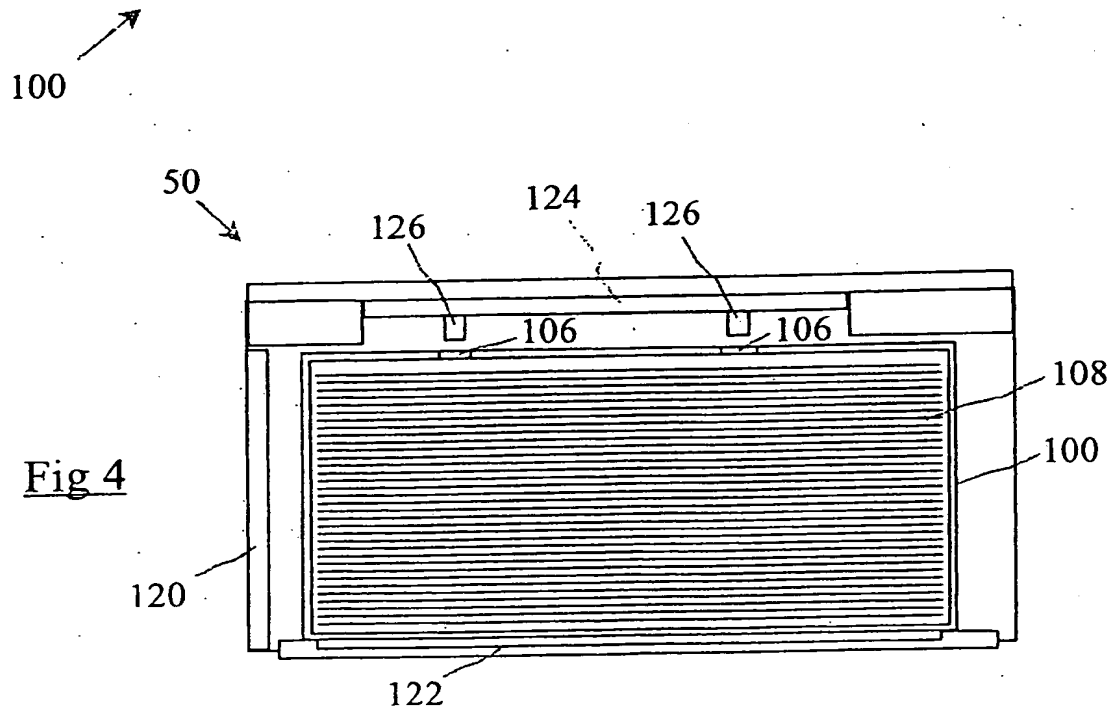
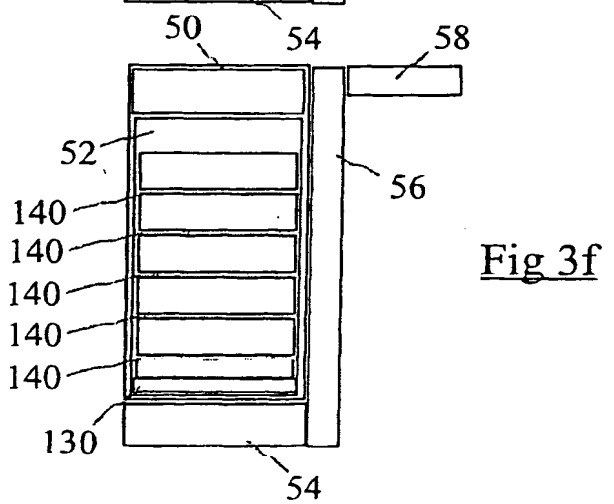
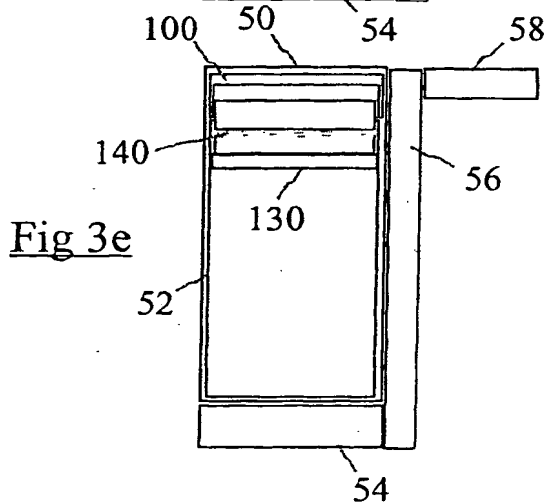
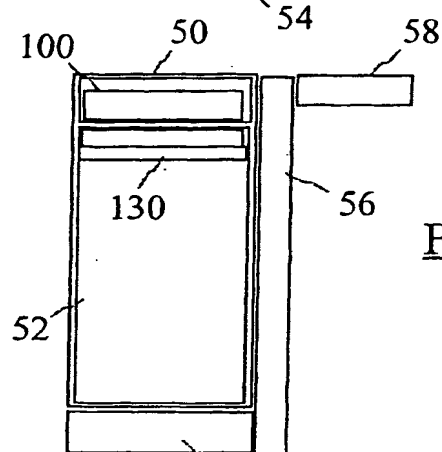
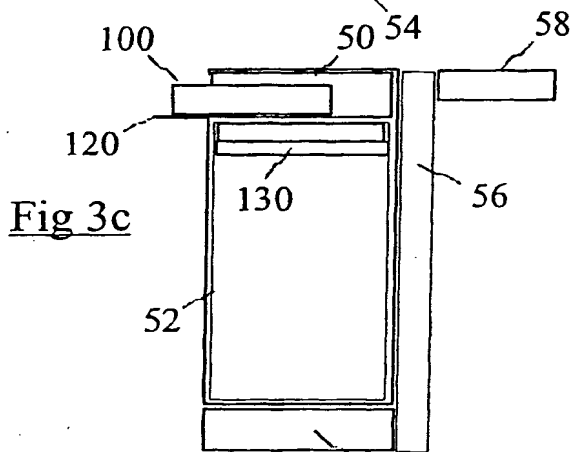
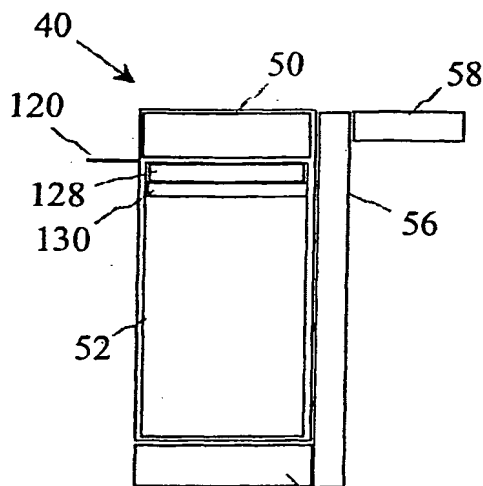
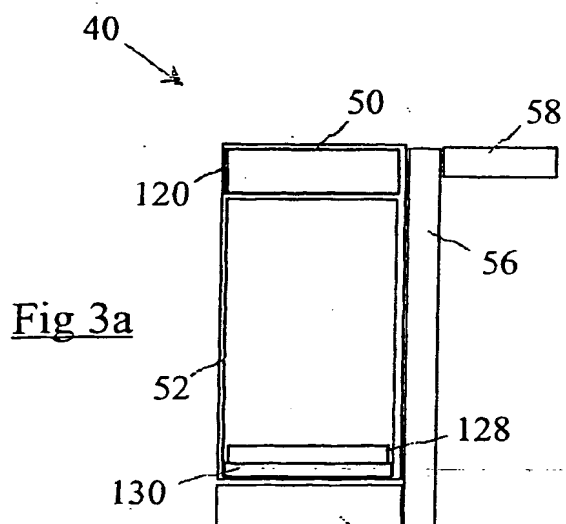
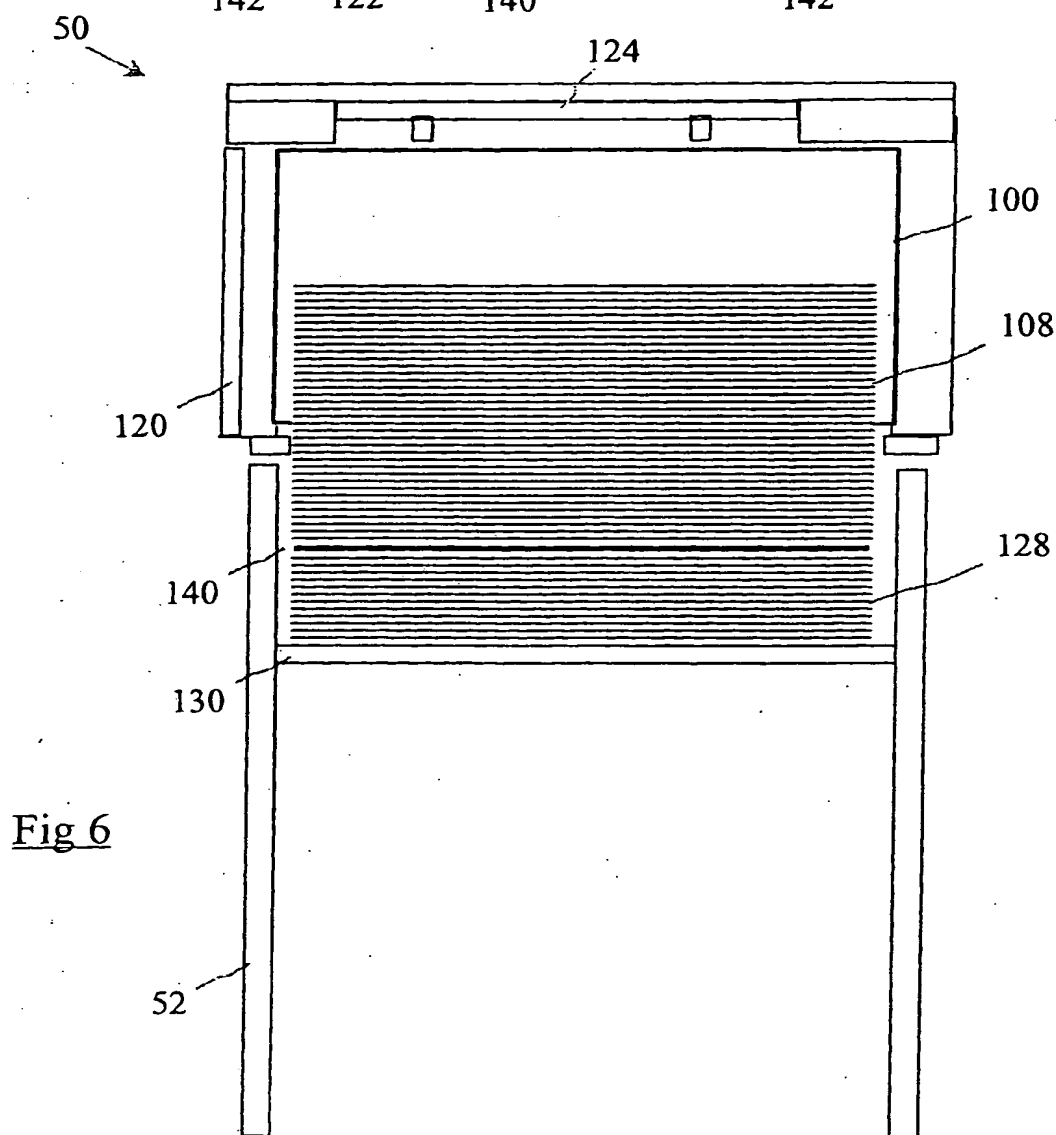
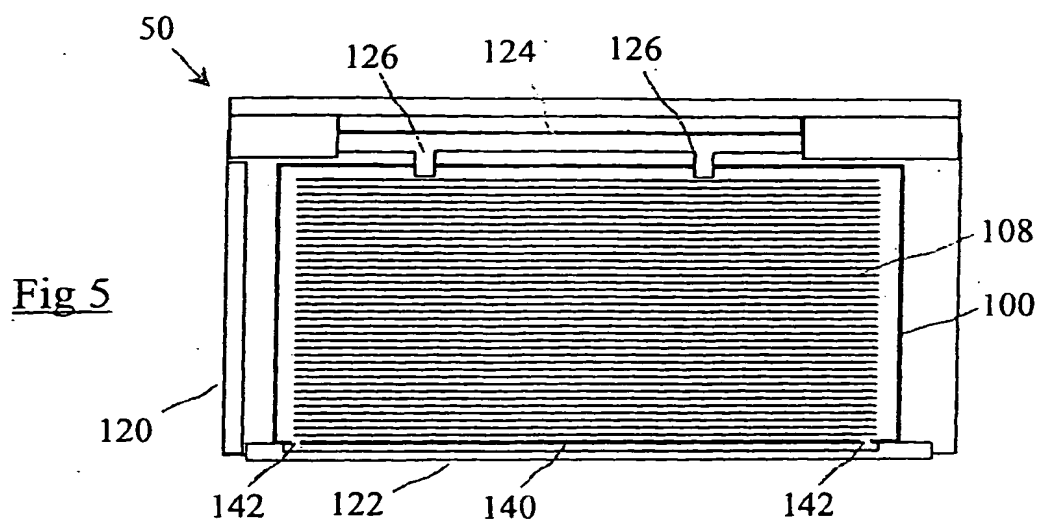


Fig 4





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